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ABSTRACT

This study was designed to determine the relative impact of dichotomized task performance data compared to percent time-spent estimates for those members performing each task on the group job descriptions determined through application of the Comprehensive set of Occupational Data Analysis Programs (CODAP). Using groups identified by a routine application of the CODAP system, the percent members performing vector was found to correlate in the mid to high 90's with the percent time spent by a total group vector or group job description. These findings suggest that in groups of five or more individuals, dichotomized task performance data, which has previously been shown to have high reliability and validity, is the most critical component in the resultant group job description. Further possible time-spent inaccuracies in individual job descriptions would not be expected to cause major changes in the group job description since its unique contribution accounts for effectively less than 10 percent of the total variance. These results are consistent across different sized groups of varying homogeneity. This report will be of interest only to those agencies engaged in occupational data analyses employing the CODAP system. (Author)

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AIR FORCE HUMAN RESOURCES LABORATORY

SENSITIVITY OF GROUP JOB DESCRIPTIONS TO POSSIBLE INACCURACIES IN INDIVIDUAL JOB DESCRIPTIONS

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SENSITIVITY OF GROUP JOB DESCRIPTIONS TO POSSIBLE INACCURACIES IN INDIVIDUAL JOB DESCRIPTIONS

I. INTRODUCTION

The Comprehensive set of Occupational Data Analysis Programs (CODAP) has been under continuous development by the Occupational Research Division for more than 10 years (Phalen & Christal, 1973). During this period, constant methodological development and program refinement has resulted in a highly efficient, if complex, series of interrelated computer programs designed for analyzing and retrieving occupational survey information collected through administration of job-task inventories. The initial rationale and supporting research upon which the Air Force based its decision to employ the inventory approach to obtaining required job or occupational data has been comprehensively summarized by Morsh, Madden, and Christal (1961) and Morsh and Archer (1967). Numerous studies have been conducted and reported which indicate a high degree of consistency and reliability in job information collected from incumbents at two points in time using task inventories. Recently, Christal (1971) reported a high degree of stability in consolidated or group job descriptions with split-half correlations ranging from .813 to .997 for both the "percent members performing" and "percent time spent" vectors. Reliability of these vectors is a basic prerequisite to the successful application of the CODAP system.

II. STATEMENT OF THE PROBLEM

One of the major program sequences in the CODAP series is designed to determine the existing job type groupings in Air Force career ladders. In the process of completing the job inventory, each job incumbent first checks every listed task which he performs in his job and then provides a relative time-spent estimate of the comparative amount of time spent on each task performed. From this information, an individual job description specifying the tasks performed and the approximate percent of total working time spent on each task can be easily derived. These task-level job descriptions are used as input for an automated job clustering program which groups incumbents according to the similarity of their jobs using an iterative hierarchical grouping process. Archer (1966) has presented the program characteristics in detail using micro-examples of the computations and resultant job type determinations.

The grouping routine may, hence, be assumed to employ two elements of information: first, dichotomized task performance information or a specification of which tasks are performed by each incumbent and; second, a comparative approximation of the time spent on each of those tasks performed by each individual. Intuitively, it would be expected that the more specific and accurate the information on each job incumbent, the better the resultant groupings. However, the reliability and more importantly, the validity, may be differentially related for these two types of information. Prior research has shown that both the reliability and validity of task performance data are highly satisfactory. Currently, research is directed towards a determination of individual job description validity when relative time-spent data is employed. Related to the latter research is the question of what might be the differential impact of incorporating time-spent estimates containing some unquantifiable amount of error as opposed to using only dichotomized task performance data on the accuracy of the resultant group job descriptions. This report provides one answer to that question.

III. APPROACH

A task inventory was recently administered to a large segment of the Air Force enlisted population performing duty in the Accounting, Finance, and Auditing career field (AFS 67XXX). Following a standard CODAP job-type grouping analysis, four of the identified job clusters were selected for further study. Their specific characteristics with regard to size and within group homogeneity are shown in Table 1.

Independently for each of the four selected job types, intercorrelation matrices between three variables of interest were derived using the task-level job descriptions. Variable X is the percent of group members performing the task. Variable Y is the average percent time spent by only those members performing the task. Variable Z is the average percent time spent on each task by the total job-type group.

Beginning with one case selected at random from each job-type group, the group job description was derived and a three variable intercorrelation matrix computed. To stabilize the variances, 14 other one-case samples were randomly selected

and similar intercorrelation matrices were computed for each sample. This procedure was repeated for other group sizes with varying numbers of replications.

IV. RESULTS

The group size and number of replications, in which each sample was randomly selected from the subgroup with replacement, together with the average correlations between variables XY, XZ, and YZ are shown in Table 2.

For ease of interpretation, the average correlations for all groups between dichotomized performance data and the CODAP group job description is graphically compared with the performance by time spent data for those members performing and the group job description in Figure 1.

V. DISCUSSION AND CONCLUSIONS

For the job-type groups employed in this study, differences in size, within-group homogeneity, and uniqueness of the groups appears to have little if any relationship with the differential impact of dichotomized task performance data on the group job description when compared to the incorporation of relative time spent on task data. Because of the highly similar pattern of correlations within each of the subgroups, overall averages provide the simplest and most direct means for interpretation.

Correlations between percent members performing and the total group job description rapidly stabilize with increases in group size; approaching an asymptotic level in the mid to high 90's when group size exceeds 10 cases. Conversely, the correlations between percent time spent by members performing and the total group job description, while obviously equal to 1.00 when n=1, show an initial rapid decrease stabilizing in the .60's when the group size exceeds 50 cases.

These findings suggest that group job descriptions are relatively impervious to possible minor inaccuracies in time-spent on task estimates in each individual job description. Operationally, when the group of interest exceeds 10 cases, the unique contribution of the relative time spent estimates is equal to or less than 10% of the total variance in the group description. Thus, the group job description is effectively based on the application of considerably greater weight to the pure task performance information than to the relative time-spent values and is a stable estimate of the group's actual task level job performance.

Prior to making any attempt to generalize these findings, two further comments are necessary. First, the data reported reflect some presently unquantifiable degree of inaccuracy in the individual's derived job description. Any change in the validity of the individual's task-level job description may be expected to change the existing relationships. Second, the derived individual time-spent estimates were based on the use of a 7-point relative rating of time spent. The use of any other scale format would be expected to change the resultant job description validity and, hence, the reported correlations. While the results of this study indicates the current employment of the CODAP system yields dependable and valid group job descriptions, continued research designed to quantify and improve the validity of individual job descriptions remains a paramount requirement.

Table 1. **Characteristics of Selected Job-Type Groupings**

Identification	A	B	C	D
Job-Type Composition	Accounts Control Personnel	Travel Clerks	Military Pay Disbursement Clerks	Military Pay Records Clerks
Group Size	110	103	90	208
Average Overlap Within Group	25.6	49.0	34.7	34.9
Average Overlap Between Groups	13.7	31.9	28.0	28.8

Table 2. **Average Correlations Within Groups**

Group Size	Subgroups A X-Y	A X-Z	A Y-Z	B X-Y	B X-Z	B Y-Z	C X-Y	C X-Z	C Y-Z	D X-Y	D X-Z	D Y-Z	Average Across-Groups X-Y	Average Across-Groups X-Z	Average Across-Groups Y-Z	Number Replications per Group
1	.9195	.9195	1.0000	.9540	.9540	1.0000	.9334	.9334	1.0000	.9087	.9087	1.0000	.9289	.9289	1.0000	15
2	.8708	.9128	.9455	.9169	.9430	.9542	.8729	.8953	.9454	.8749	.9061	.9446	.8839	.9143	.9474	15
3	.8301	.8768	.9240	.9020	.9481	.9236	.8691	.9013	.8958	.8658	.9112	.9127	.8668	.9094	.9140	12
4	.8107	.9047	.8846	.8723	.9466	.8902	.8580	.9203	.8542	.8746	.9282	.8910	.8539	.9250	.8800	12
5	.8089	.9047	.8731	.8625	.9472	.8728	.8522	.9063	.8386	.8426	.9315	.8724	.8416	.9224	.8642	10
6	.7910	.8993	.8536	.8684	.9631	.8647	.8125	.9238	.7959	.8536	.9409	.8598	.8314	.9318	.8435	10
8	.7749	.9087	.8177	.8408	.9663	.8253	.8272	.9258	.7743	.8001	.9446	.8077	.8108	.9364	.8062	8
10	.7719	.9007	.8268	.8307	.9516	.8098	.8077	.9264	.7515	.7907	.9562	.7876	.8002	.9342	.7939	8
12	.7862	.9188	.8259	.8125	.9656	.7913	.7664	.9432	.7088	.7882	.9597	.7815	.7883	.9468	.7769	6
15	.8003	.9398	.8075	.8125	.9701	.7917	.7854	.9345	.7127	.8120	.9582	.7859	.8026	.9506	.7744	6
20	.7627	.9415	.7707	.7600	.9689	.7384	.7744	.9302	.6951	.7656	.9674	.7373	.7657	.9520	.7354	4
25	.7759	.9432	.7779	.7699	.9692	.7390	.7315	.9352	.6549	.7669	.9644	.7340	.7610	.9530	.7264	4
30	.7303	.9595	.7301	.7181	.9738	.6892	.7348	.9460	.6523	.7394	.9706	.7105	.7306	.9625	.6955	4
35	.6557	.9656	.6634	.7309	.9717	.6985	.7262	.9372	.6458	.7422	.9613	.7037	.7138	.9590	.6778	3
40	.7086	.9598	.7076	.7132	.9744	.6775	.7222	.9433	.6364	.7384	.9716	.7062	.7206	.9623	.6819	3
50	.6719	.9653	.6708	.6846	.9752	.6518	.7256	.9406	.6342	.7029	.9695	.6657	.6962	.9626	.6556	3
60	.6778	.9626	.6733	.7030	.9744	.6668	.7024	.9437	.6136	.7115	.9720	.6716	.6987	.9632	.6563	2
70	.6810	.9643	.6742	.6948	.9729	.6558	.6995	.9392	.6086	.7123	.9752	.6674	.6969	.9629	.6515	2
80	.6797	.9676	.6705	.6415	.9753	.6084	.7071	.9423	.6130	.6920	.9709	.6515	.6801	.9640	.6358	2
90	.6774	.9654	.6653	.6495	.9762	.6147	.7031	.9425	.6096	.6961	.9744	.6543	.6815	.9646	.6360	2
100	.6610	.9667	.6532	.6486	.9757	.6140	–	–	–	.6686	.9694	.6279	.6594	.9706	.6317	1
125	–	–	–	–	–	–	–	–	–	.7006	.9767	.6568	–	–	–	1
150	–	–	–	–	–	–	–	–	–	.6924	.9731	.6461	–	–	–	1
175	–	–	–	–	–	–	–	–	–	.6613	.9727	.6193	–	–	–	1
200	–	–	–	–	–	–	–	–	–	.6521	.9744	.6098	–	–	–	1
Total	.6615	.9669	.6514	.6404	.9759	.6065	.7031	.9425	.6096	.6562	.9747	.6138	–	–	–	1
n		(110)			(103)			(90)			(208)					

Variable X = percent of group members performing.
Variable Y = percent time spent by members performing.
Variable Z = percent time spent by total group.

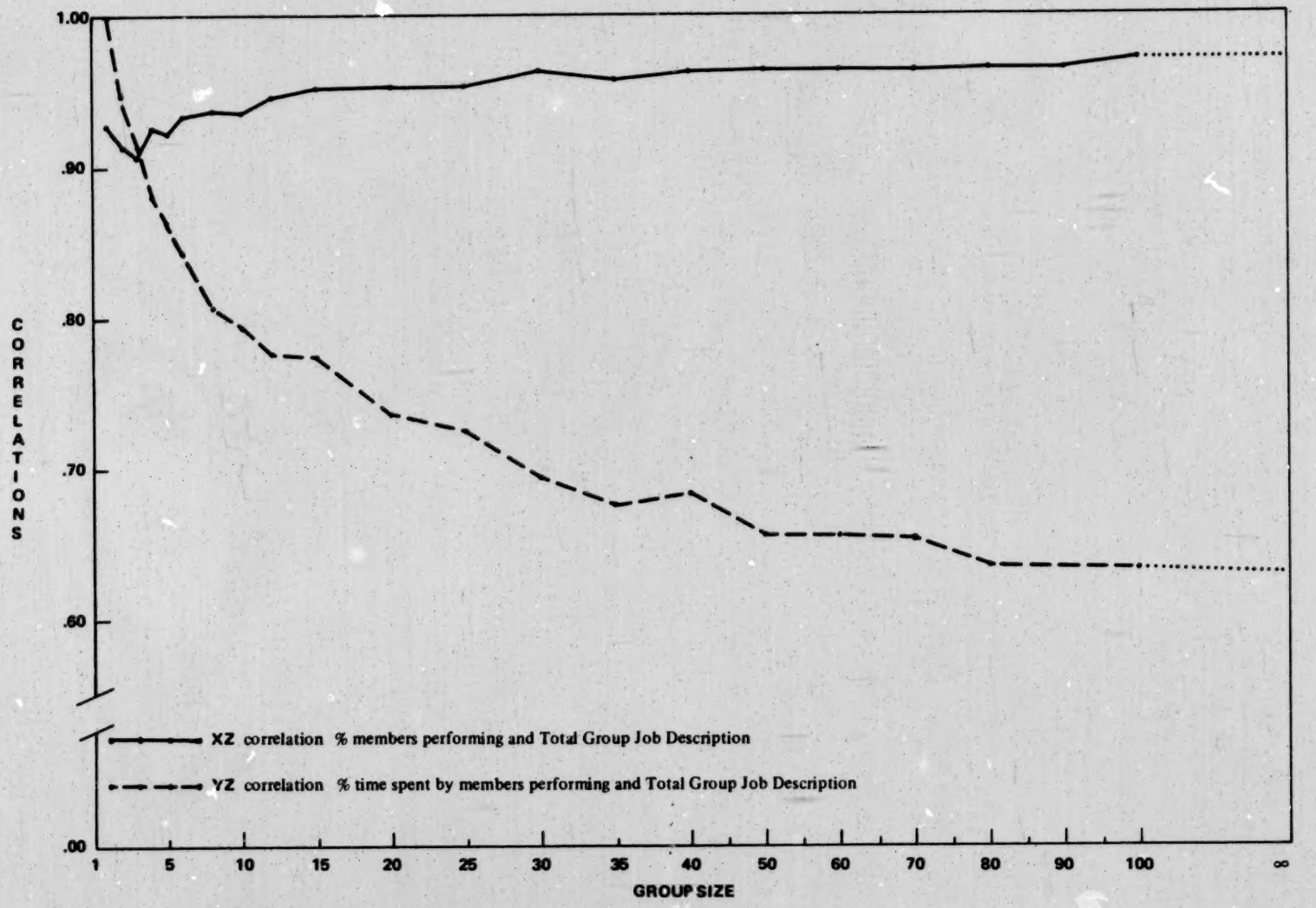

Figure 1. **Correlations as a function of a group size.**

REFERENCES

Archer, W.B. *Computation of group job descriptions from occupational survey data.* PRL-TR-66-12, AD-653 543. Lackland AFB, Tex.: Personnel Research Laboratory, Aerospace Medical Division, December 1966.

Christal, R.E. *Stability of consolidated job descriptions based on task inventory survey information.* AFHRL-TR-71-48, AD-734 739. Lackland AFB, Tex.: Personnel Research Division, Air Force Human Resources Laboratory, August 1971.

Morsh, J.E., & Archer, W.B. *Procedural guide for conducting occupational surveys in the United States Air Force.* PRL-TR-67-11, AD-664 036. Lackland AFB Tex.: Personnel Research Laboratory, Aerospace Medical Division, September 1967.

Morsh, J.E., Madden, J.M., & Christal, R.E. *Job analysis in the United States Air Force.* WADD-TR-61-113, AD-259 389. Lackland AFB, Tex.: Personnel Research Laboratory, Wright Air Development Division, February 1961.

Phalen, W.J., & Christal, R.E. *Comprehensive occupational data analysis programs (CODAP): Group membership (GRMBRS/GRPMBR) and automated diagramming (DIAGRM) programs.* AFHRL-TR-73-5, AD-767 199. Lackland AFB, Tex.: Personnel Research Division, Air Force Human Resources Laboratory, April 1973.